

quiz Tuesday 2.1-2.3

2.3 Extension--Truth tables

Conditional statements can be written using symbolic notation.

If p, then q. p—hypothesis q—conclusion

 $p \rightarrow q$ "if p, then q" or "p implies q"**Symbolic Notation**Conditional $p \rightarrow q$ Converse $q \rightarrow p$ Inverse $\sim p \rightarrow \sim q$ Contrapositive $\sim q \rightarrow \sim p$ Biconditional $p \leftrightarrow q$

The truth value of a statement is either true (T) or false (F).
A truth table shows the conditions when a conditional statement is true.
It is only false when a true hypothesis produces a false conclusion.

p	q	$p \rightarrow q$	$q \rightarrow p$	$\sim p \rightarrow \sim q$	$\sim q \rightarrow \sim p$
T	T	T	T	T	T
T	F	F	T	T	F
F	T	T	F	F	T
F	F	T	T	T	T

Truth Table for Conditional

p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

Examples:

Make a truth table for the logical statement.

$p \rightarrow \sim q$

p	q	$\sim q$	$p \rightarrow \sim q$
T	T	F	F
T	F	T	T
F	T	F	T
F	F	T	T

Specific Example:

If it is raining, then you have an umbrella.

It's raining and you don't have an umbrella.

It's not raining and you don't have an umbrella.

It's not raining and you have an umbrella.

$\sim(p \rightarrow q)$

p	q	$p \rightarrow q$	$\sim(p \rightarrow q)$
T	T	T	F
T	F	F	T
F	T	T	F
F	F	T	F

Truth tables can also be made for conjunctions (and) and disjunctions (or).

"p and q" is true only when both p and q are true (symbolic: $p \wedge q$)

"p or q" is false only when both p and q are false (symbolic: $p \vee q$)

\wedge AND

Conjunction		
p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

\vee OR

Disjunction		
p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

Ex: $\sim p \vee q$

p	q	$\sim p$	$\sim p \vee q$
T	T	F	T
T	F	F	F
F	T	T	T
F	F	T	T

ex: $(p \vee q) \wedge \sim r$

p	q	r	$p \vee q$	$\sim r$	
T	T	T	T	F	F
T	F	T	T	F	F
T	T	F	T	T	T
T	F	F	T	T	T
F	T	T	F	F	F
F	F	T	F	F	F
F	T	F	T	T	T
F	F	F	F	T	F

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